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Inventor: Lawrence J. Seigel
Title: "METHOD AND SYSTEM FOR EVALUATING THE EFFICIENCY
OF AN AIR CONDITIONING APPARATUS"
Serial No.: Unassigned
Docket No.: 03237.0001U2
Filing Date: December 27, 2001
Contact: Lawrence D. Maxwell, Esq. (404) 688-0770
EXPRESS MAIL LABEL NO.: EL491884035US

Sheet 1 of 22

100034735 - 122201

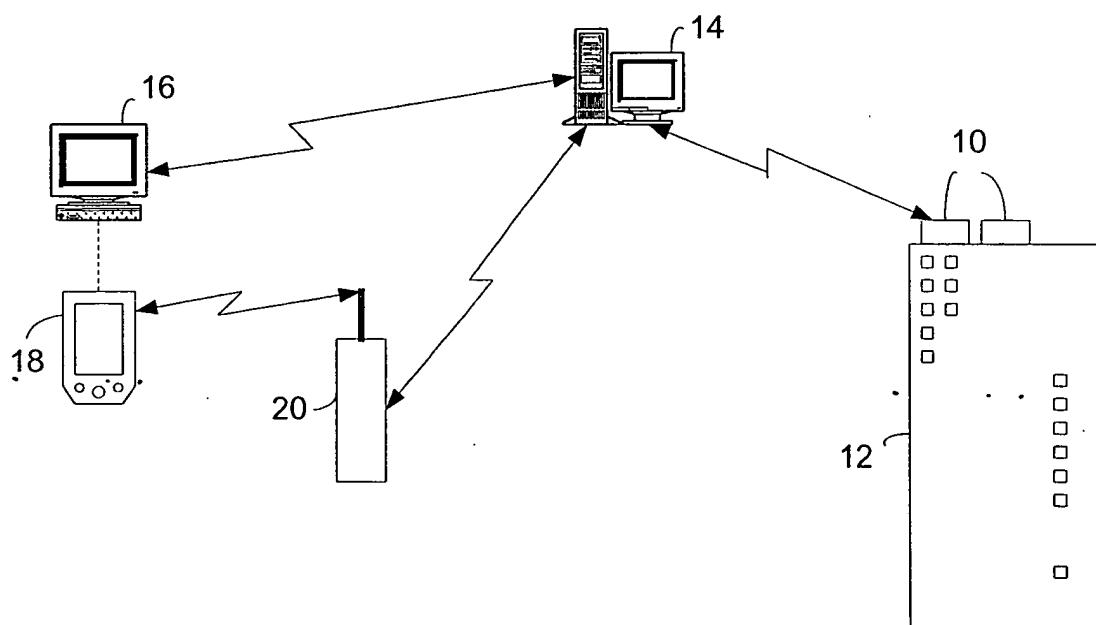


FIG. 1

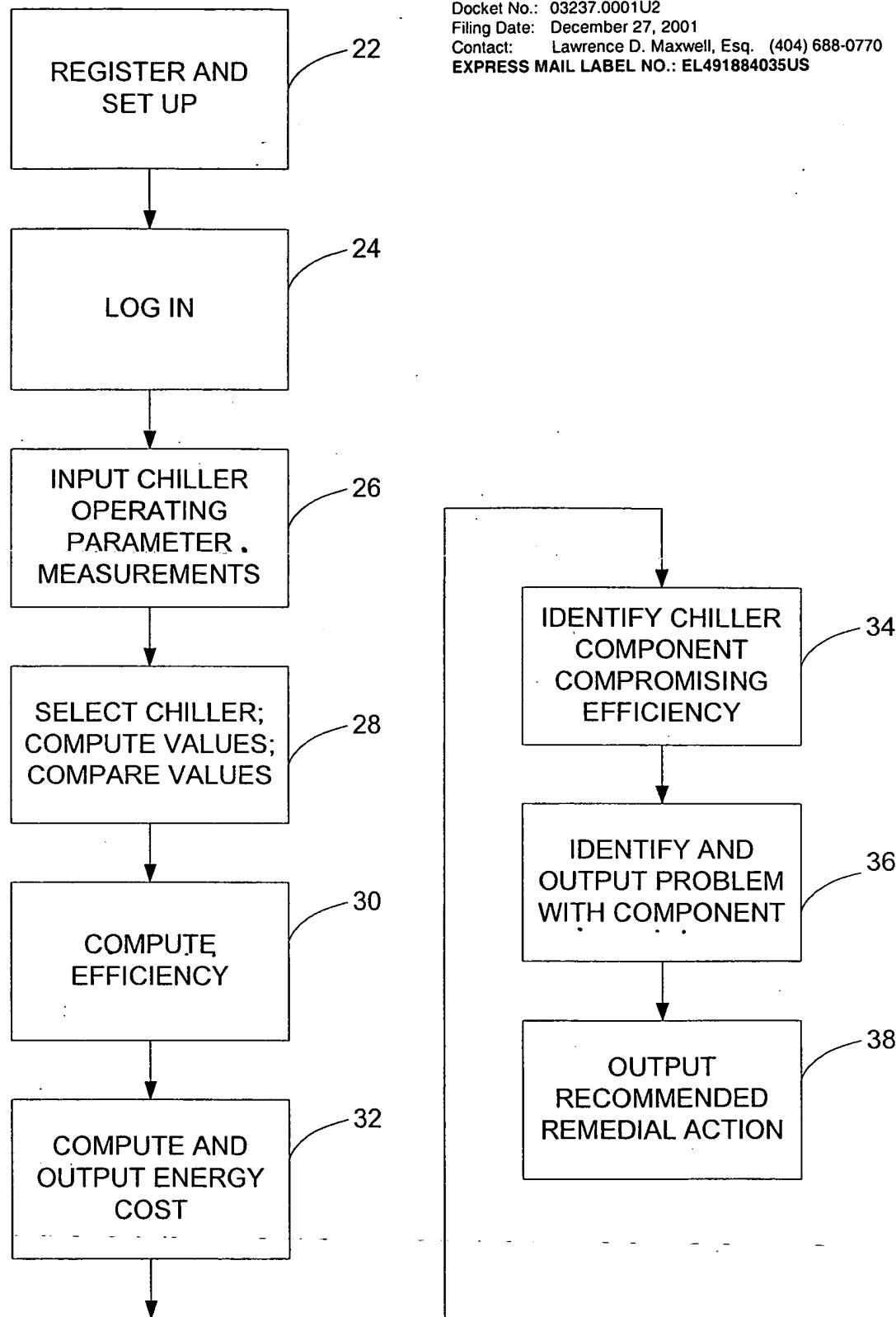


FIG. 2

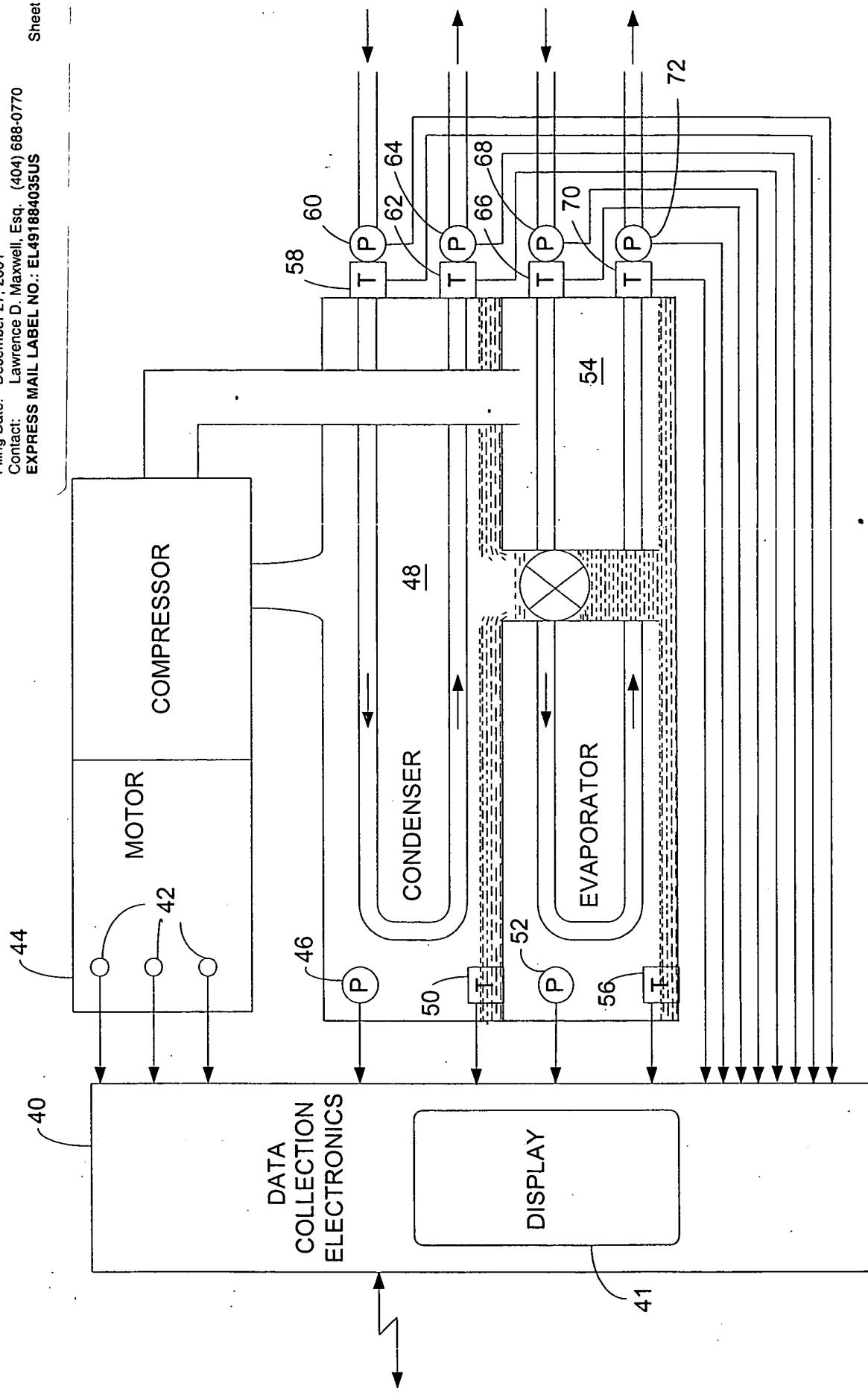


FIG. 3

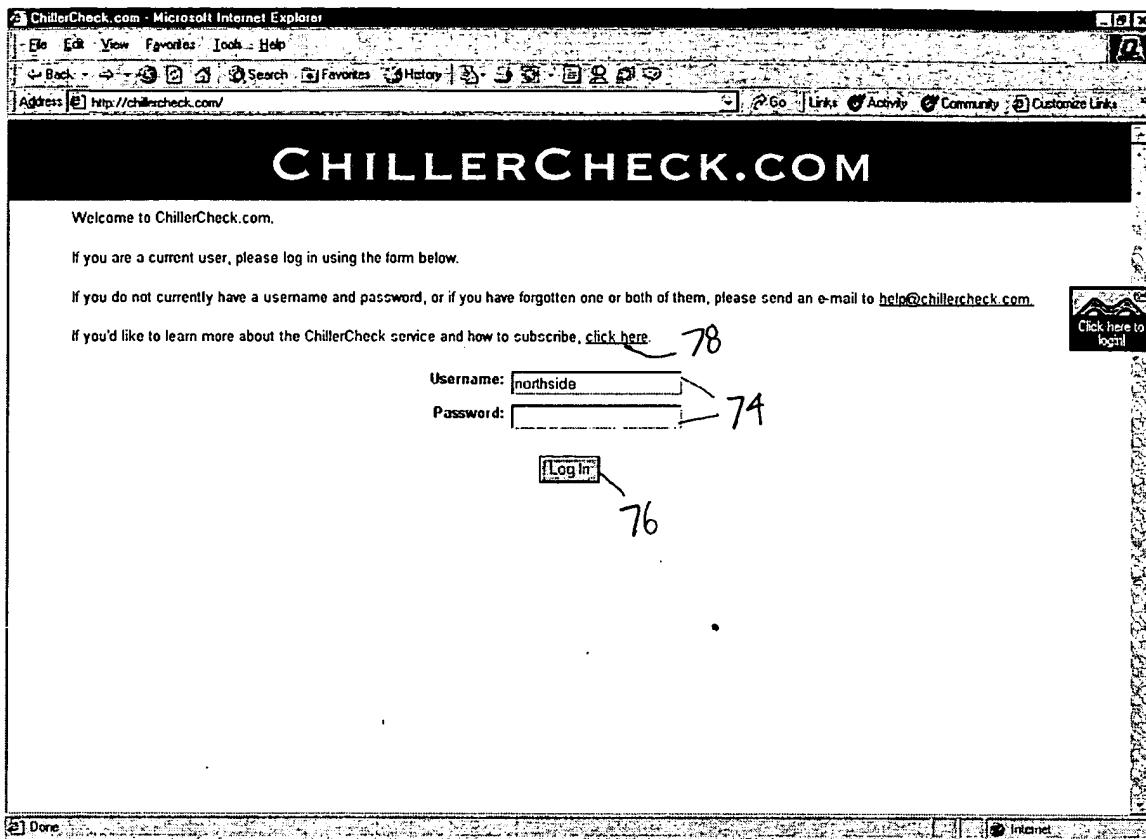


FIG. 4

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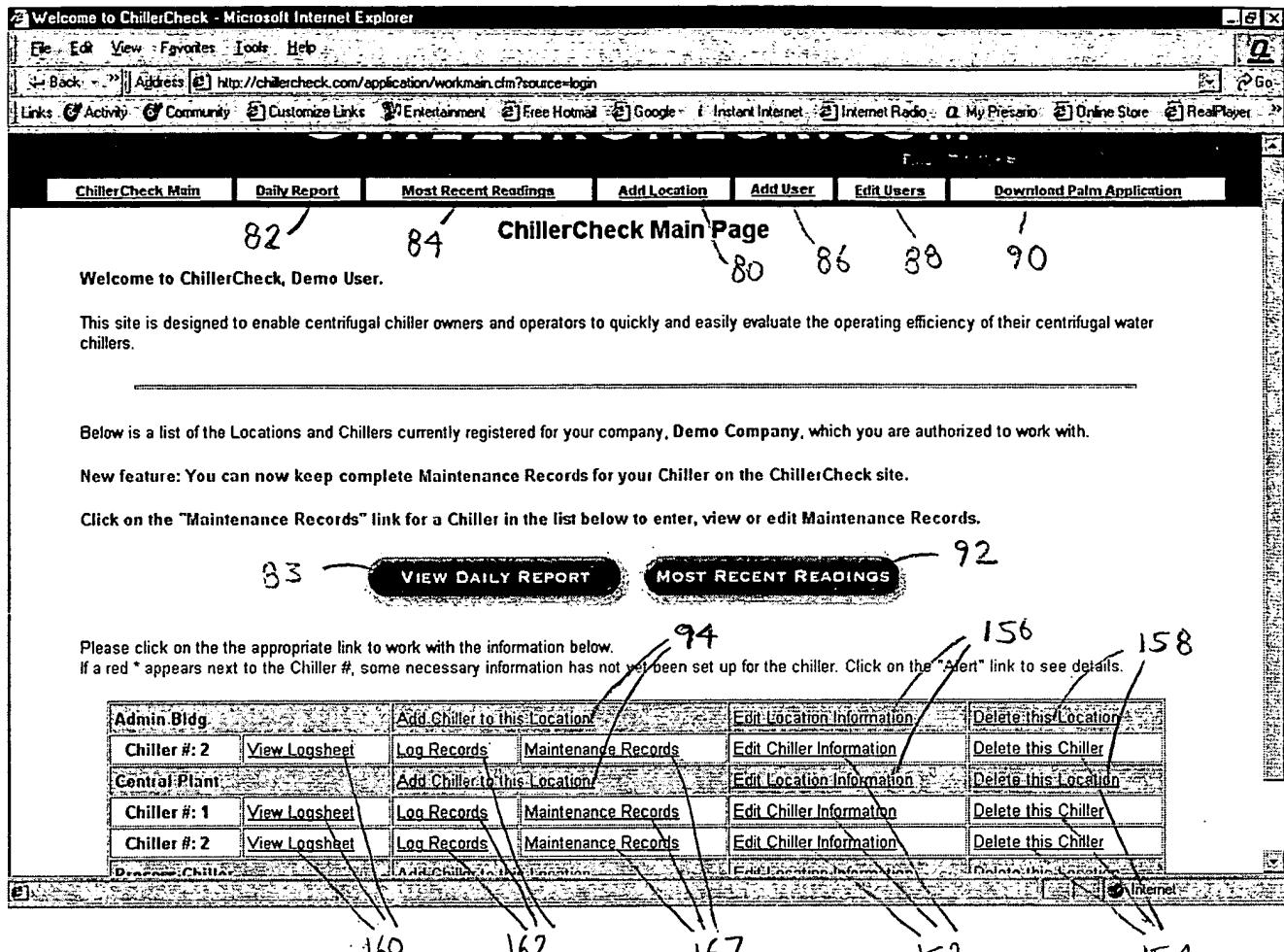


FIG. 5

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CHILLERCHECK.COM

ChillerCheck Main	Daily Report	Most Recent Readings	Add Location	Add User	Edit Users	Download Palm Application
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82 84 Add a Chiller at Atlanta Office Bldg. 80 86 88 90

Please fill in all information in the form below, then click the "Add Chiller" button.

You will then be taken back to the ChillerCheck Main page, where you can work with any of your Location, Chiller or Chiller Log records.

Note: If you do not have all the information below available at this time, you can still add the Chiller by filling out only the required information (marked with a * below) now. You can come back later and add the rest of the information. However, you will not be able to make efficiency calculations or graph trends until all Chiller information has been recorded.

Chiller Information

<input type="button" value="Help!"/>	* Chiller #:	<input type="text" value="96"/>
<input type="button" value="Help!"/>	* Make:	<input type="text" value="Choose a Make 98"/>
<input type="button" value="Help!"/>	* Model:	<input type="text" value="100"/>
<input type="button" value="Help!"/>	Serial #:	<input type="text" value="102"/>
<input type="button" value="Help!"/>	Refrigerant Type:	<input type="text" value="Choose a refrigerant 104"/>
<input type="button" value="Help!"/>	Year Chiller Was Manufactured:	<input type="text" value="Choose a year of manufacture 106"/>
<input type="button" value="Help!"/>	Efficiency Rating (kw/ton):	<input type="text" value="108"/>
<input type="button" value="Help!"/>	* Energy Cost (\$/kw hour):	<input type="text" value="110"/>

FIG. 6A

Help!	* Weekly Hrs. of Operation:	112
Help!	* Weeks Per Year of Operation:	114
Help!	* Average Load Profile:	116 %
Help!	* Tons:	118
Help!	* Design Voltage:	120
Help!	* Full-Load Amperage:	122

Now we need some information about the Condenser.

Help!	Design Condenser Water Pressure Drop: (This value may be omitted if necessary, but your calculations will be more accurate if you have it. If you enter a value, you must choose a unit of measure.)	Choose a pressure unit <input type="button" value="▼"/>
		124
		126
Help!	Please choose a unit of measurement for the Actual Condenser Water Pressure Drop:	Choose a pressure unit <input type="button" value="▼"/>
		128
Help!	Please choose a unit of measurement for Condenser Pressure:	Choose a pressure unit <input type="button" value="▼"/>
		130
Design Condenser Approach Temp: (This value may be omitted if you do not have it.)		132

FIG. 6B

Now we need some information about the Evaporator.

<p>Design Chill Water Pressure Drop: (This value may be omitted if necessary, but your calculations will be more accurate if you have it. If you enter a value, you must choose a unit of measure.)</p>	<p>Choose a pressure unit</p> <p>134 136</p>
<p>Please choose a unit of measurement for the Actual Chill Water Pressure Drop:</p>	<p>Choose a pressure unit</p> <p>138</p>
<p>Please choose a unit of measurement for Evaporator Pressure:</p>	<p>Choose a pressure unit</p> <p>140</p>
<p>Design Evaporator Approach Temp: (This value may be omitted if you do not have it.)</p>	<p>Choose a method</p> <p>142</p>
<p>Evaporator Design Outlet Water Temp:</p>	<p>Choose a method</p> <p>144</p>
<p>Please choose a method of calculating Oil Pressure Differential for the Compressor.</p>	
<p>Calculate Differential by:</p>	<p>Choose a method</p> <p>146</p>

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FIG. 6C

There are just a few more things we need to know about this chiller.

Does the chiller have a readout for Purge Run Time?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No 143
If so, is the Purge Run Time measured only in minutes, or in both hours and minutes?	<input checked="" type="checkbox"/> Minutes Only <input type="checkbox"/> Hours and Minutes 145
Please set a maximum amount of Purge Run Time per day you wish to allow before you are sent an alert.	Minutes 147
Does this chiller have a readout for Bearing Temperature?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No 149
Operator Notes: (Enter any notes you might want to record about this chiller.)	150
Add Chiller Info	

148

FIG. 6D

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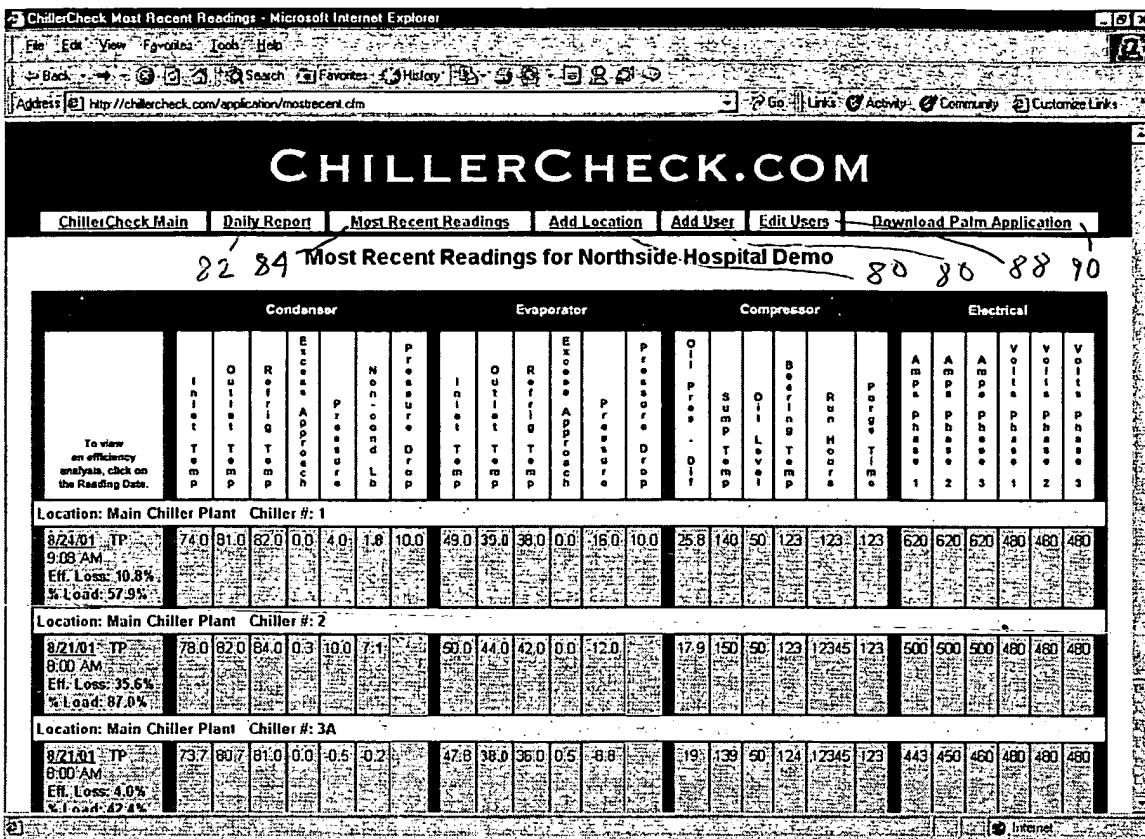


FIG. 7

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10031785 - 122701

Log Sheet - Microsoft Internet Explorer

File Edit View Favorites Tools Help

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Links Activity Community Customize Links Entertainment Free Hotmail Google Instant Internet Internet Radio My Presario Online Store RealPlayer

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ChillerCheck Main Chiller #2 Main Page Maint. Records Add Maint. Record Add Log Record View Logsheet Chart Trends

163 165 Log Sheet for Chiller #: 2 at Admin Bldg 178 170 172

Condenser										Evaporator					Compressor				Electrical			
Inlet Temp	Outlet Temp	Refrig Temp	Excess Approach	Pressure	Non-cond Drop	Inlet Temp	Outlet Temp	Refrig Temp	Excess Approach	Pressure	Pressure Drop	Oil Press. Diff	Sabp Temp	Oil Level	Run Hours	amps Phase 1	amps Phase 2	amps Phase 3	Volts Phase 1	Volts Phase 2	Volts Phase 3	
7/3/01 DU 2:42 PM Eff. Loss: 13.3% % Load: 77.9%	78.7	85.8	90.2	4.6	168.0	9.9	10.0	51.9	41.7	38.0	2.0	65.5	14.0	20.0	138	60	30290.0	850	888	886	480	480
7/2/01 DU 1:42 PM Eff. Loss: 14.3% % Load: 83.3%	77.0	83.3	88.4	5.1	163.0	1.3	10.0	51.7	42.0	38.0	2.0	65.5	20.0	20.0	135	50	30240.0	925	950	950	480	480
6/27/01 DU 2:58 PM Eff. Loss: 16.5% % Load: 79.0%	77.7	83.3	88.4	5.5	163.0	1.3	10.0	51.4	42.4	38.0	2.0	65.5	19.0	20.0	135	50	30170.0	898	900	901	480	480
6/26/01 DU 12:06 PM	78.5	84.5	87.9	4.5	163.0	0.0	10.0	49.8	42.3	38.5	4.3	65.5	14.0	20.0	135	60	30150.0	700	700	700	480	480

[Done] [Internet]

FIG. 8

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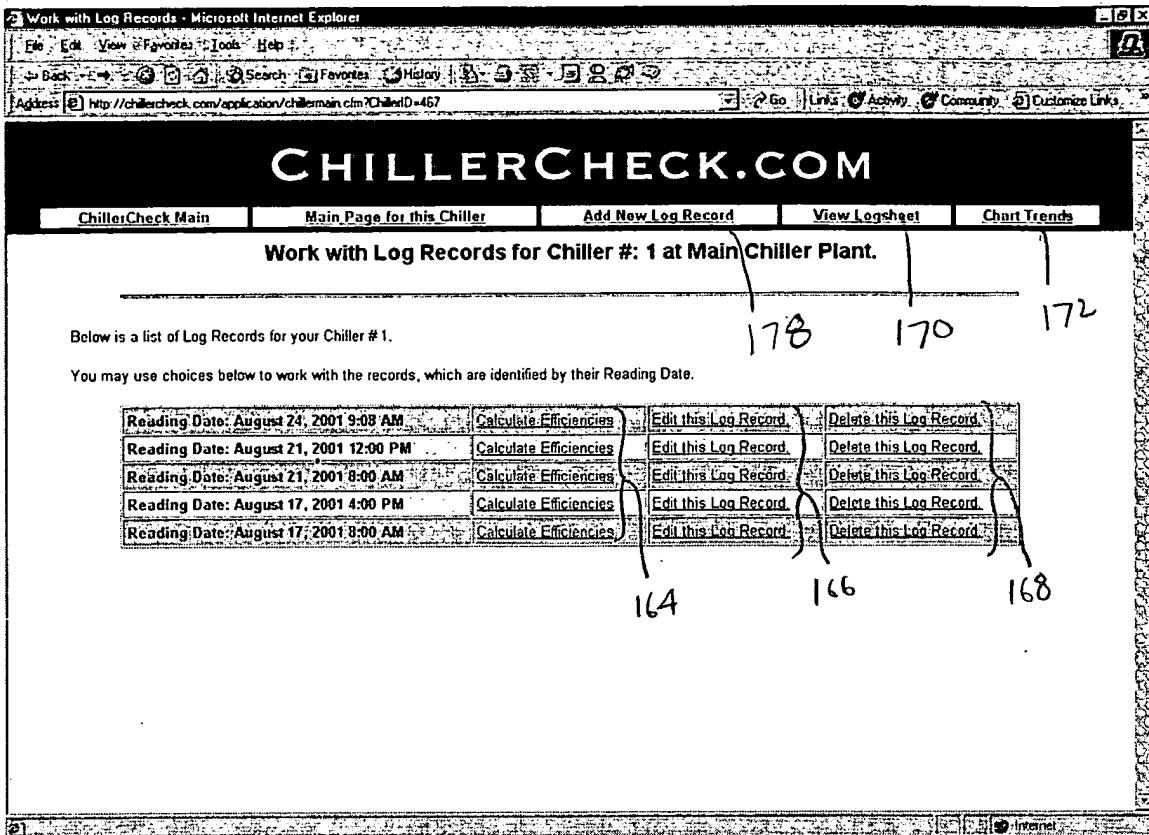


FIG. 9

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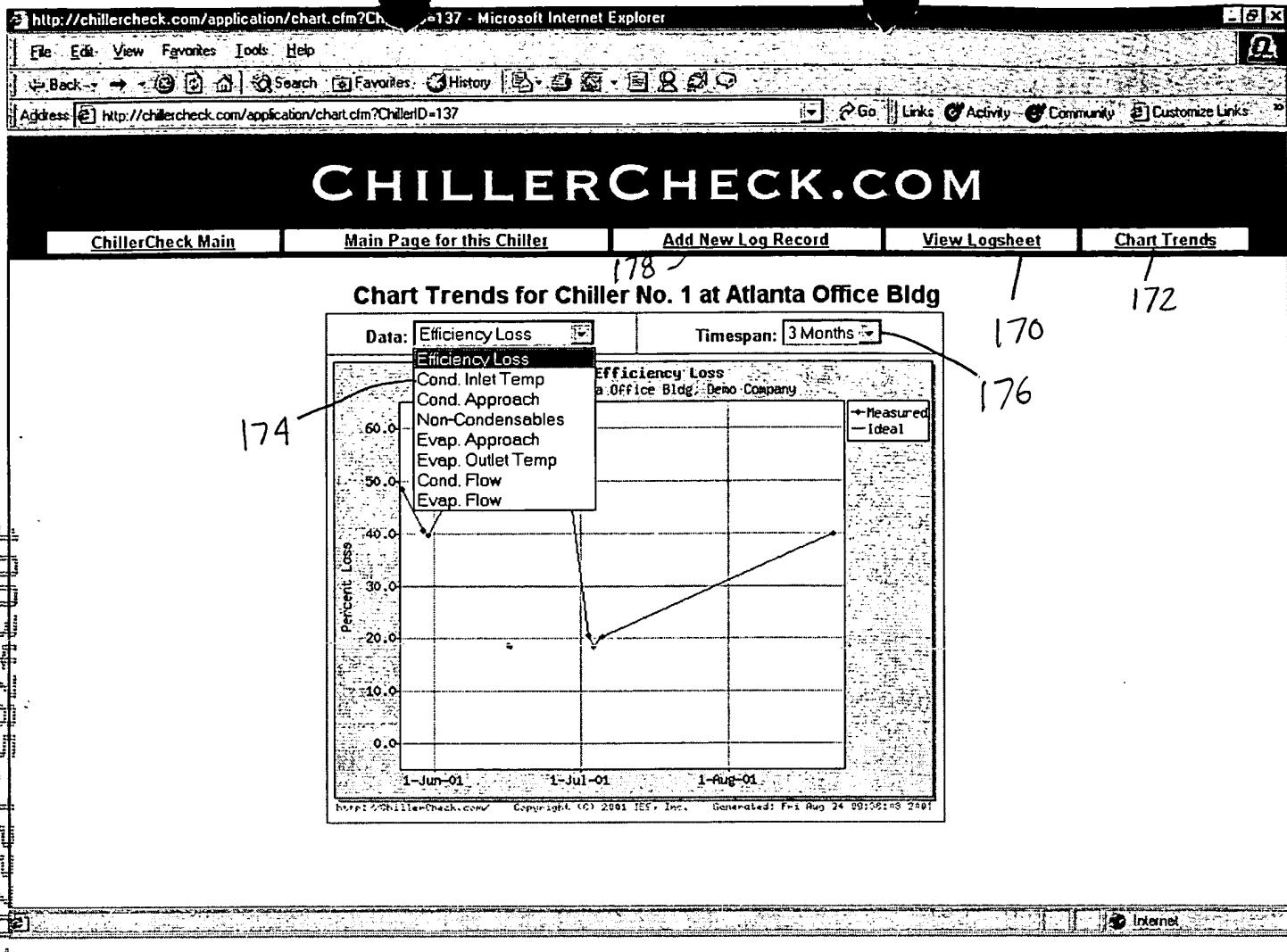


FIG. 10

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CHILLERCHECK.COM

[ChillerCheck Main](#) [Main Page for this Chiller](#) [Add New Log Record](#) [View Logsheet](#) [Chart Trends](#)

Add a Log Record for Chiller #: 1 at Main Chiller Plant.

Please enter your readings into the form below, then click the "Add Record" button:

Log Record

Operator:	Tim	180
Reading Date:	August 24, 2001	178
Reading Time:	9:32 AM	170
Condenser Readings		
Inlet Water Temp:	°F	184
Outlet Water Temp:	°F	186
Refrigerant Temp:	°F	188
Condenser Pressure:	PSIG	190
Actual Condenser Water Pressure Drop:	PSIG	192
Evaporator Readings		
Inlet Water Temp:	°F	194
Outlet Water Temp:	°F	196
Refrigerant Temp:	°F	198
Evaporator Pressure:	In. Hg.	200
Actual Chill Water Pressure Drop:	PSIG	202

FIG. 11A

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Compressor Readings

Oil Pressure (High):	lb. 204
Oil Sump Temp:	°F 206
Oil Level:	% 208
Bearing Temp:	°F 210
Run Hours:	212
Purge Pumpout Time:	214

Electrical Readings

Amps Phase 1:	216
Amps Phase 2:	218
Amps Phase 3:	220
Volts Phase 1:	222
Volts Phase 2:	224
Volts Phase 3:	226

Operator Notes

228	
-----	--

Add Log Record 230

FIG. 11B

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ChillerCheck Main	Chiller #1 Main Page	Maint. Records	Add Maint. Record	Add Log Record	View Logsheet	Chart Trends								
Efficiency Calculation for Chiller #1 at Admin Bidg Reading taken on <u>October 10, 2001 at 1:50 PM</u>														
														
Results														
<table border="1"> <tr> <td>Target Cost to Run for Year</td> <td>\$ 54,583</td> </tr> <tr> <td>Actual Cost to Run for Year</td> <td>\$ 65,993</td> </tr> <tr> <td>Cost of Efficiency Loss</td> <td>\$ 11,410</td> </tr> <tr> <td>Efficiency Loss</td> <td>20.9%</td> </tr> </table>							Target Cost to Run for Year	\$ 54,583	Actual Cost to Run for Year	\$ 65,993	Cost of Efficiency Loss	\$ 11,410	Efficiency Loss	20.9%
Target Cost to Run for Year	\$ 54,583													
Actual Cost to Run for Year	\$ 65,993													
Cost of Efficiency Loss	\$ 11,410													
Efficiency Loss	20.9%													

Detailed Cost of Efficiency Loss

Problem	Efficiency Loss	\$ Cost	Solution
Fouled Tubes - Condenser	9.5%	\$ 5,187	Fix It,
Non-condensables - Condenser	11.4%	\$ 6,222	Fix It,

Your Condenser Water Flow is 3.6% below design.

Your Evaporator Water Flow is 21.9% below design.

There is an electrical imbalance that may be decreasing the performance of your Chiller.
 The voltage imbalance is 3.62%.

The % load at this reading time was 88.9%.

Back to the main page for this Chiller.

FIG. 12



FIG. 13

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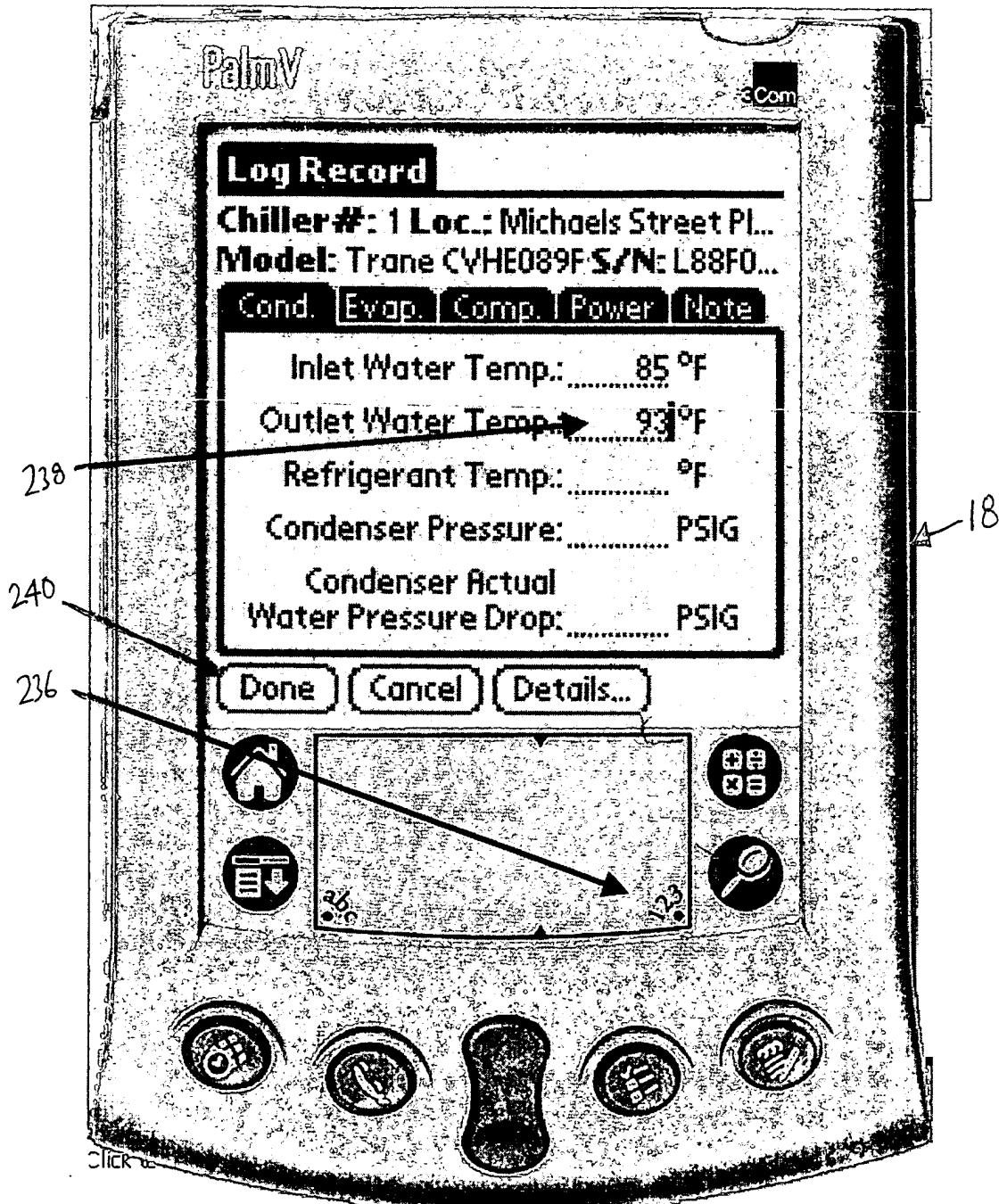


FIG. 14

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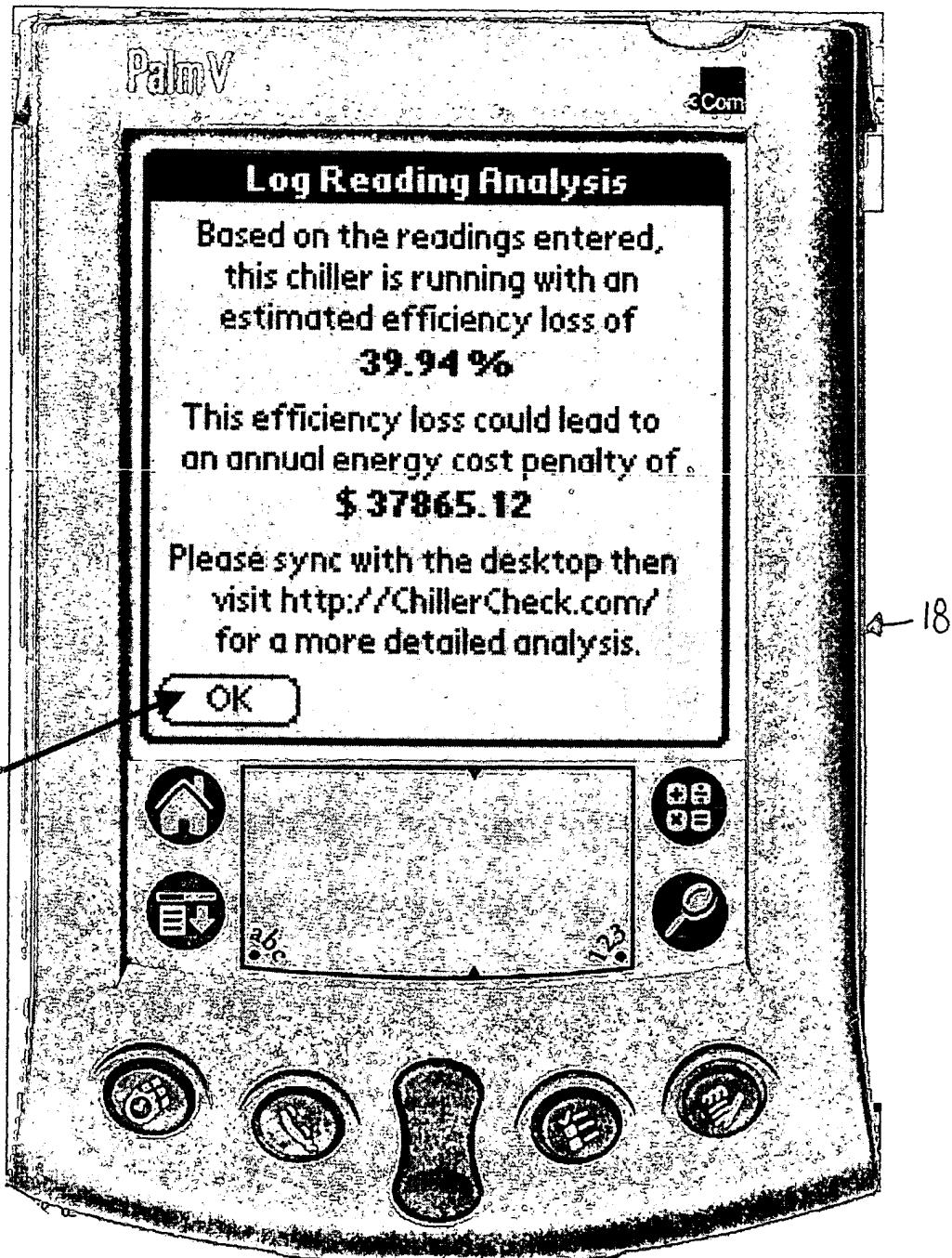


FIG. 15

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Add Maintenance Record for Chiller #1 at Admin Bldg.

163 165 178 170 172

Please fill in all information in the form below, then click the "Add Maintenance Record" button.

You will then be taken back to the Maintenance page for this chiller.

Maintenance Information

Annual Maintenance Date:		<input type="button" value="Select a Month"/> <input type="button" value="Day"/> <input type="button" value="Year"/>
Oil Maintenance		
Oil Change Date:		<input type="button" value="Select a Month"/> <input type="button" value="Day"/> <input type="button" value="Year"/>
Date Oil Added:		<input type="button" value="Select a Month"/> <input type="button" value="Day"/> <input type="button" value="Year"/>
Quantity of Oil Added (Gallons):		<input type="text"/>
Oil Analysis Date:		<input type="button" value="Select a Month"/> <input type="button" value="Day"/> <input type="button" value="Year"/>
Eddy Current Tests		
Eddy Current Test Date (Condenser):		<input type="button" value="Select a Month"/> <input type="button" value="Day"/> <input type="button" value="Year"/>
Eddy Current Test Date (Evaporator):		<input type="button" value="Select a Month"/> <input type="button" value="Day"/> <input type="button" value="Year"/>
Major Stop Inspection (compressor teardown)		
Major Stop Inspection:		<input type="button" value="Select a Month"/> <input type="button" value="Day"/> <input type="button" value="Year"/>
Refrigerant Maintenance		
Refrigerant Analysis Date:		<input type="button" value="Select a Month"/> <input type="button" value="Day"/> <input type="button" value="Year"/>
Date Refrigerant Added:		<input type="button" value="Select a Month"/> <input type="button" value="Day"/> <input type="button" value="Year"/>
Quantity of Refrigerant Added (Pounds):		<input type="text"/>
Tube Cleaning		
Condenser Tube Cleaning Date:		<input type="button" value="Select a Month"/> <input type="button" value="Day"/> <input type="button" value="Year"/>
Evaporator Tube Cleaning Date:		<input type="button" value="Select a Month"/> <input type="button" value="Day"/> <input type="button" value="Year"/>
Purge Maintenance		
Purge Tank Reclaim Date:		<input type="button" value="Select a Month"/> <input type="button" value="Day"/> <input type="button" value="Year"/>
Purge Run Time Reading When Tank Reclaimed:		<input type="text"/>

FIG. 16A

100245620001

10034785-122701

Purge Filter Dryer Change Date:	Select a Month	Day	Year
Major Repairs			
Major Repair Date:	Select a Month	Day	Year
Major Repair Description:			
Notes			
Maintenance Notes: (You may enter a note about any type of maintenance.)			
<input type="button" value="Add Maintenance Record"/>			

FIG. 16B

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Maintenance Records for Chiller #: 1 at Admin Bldg.

163 165 178 170 172

Below is a list of the most recent Maintenance Operations for your Chiller # 1. You may click on the name of a Maintenance Type to view all records of that type.

Maintenance Type	Most Recent Maintenance
Annual Maintenance :	October 18, 2001
Oil Maintenance	
Oil Change :	October 18, 2001
Oil Analysis :	October 1, 2001
Eddy Current Tests	
Condenser Eddy Current :	September 9, 2001
Evaporator Eddy Current :	September 10, 2001
Major Stop Inspection (compressor teardown)	
Major Stop :	January 3, 2000
Refrigerant Maintenance	
Refrigerant Analysis :	January 3, 2000
Refrigerant Added :	August 23, 2001 -- Quantity: 100 Pounds
Tube Cleaning	
Condenser Tube Cleaning :	October 19, 2001
Evaporator Tube Cleaning :	February 5, 2000
Purge Maintenance	
Purge Tank Reclaim :	February 7, 2001 -- Purge Run Time at Change: 1212123
Major Repairs	
Major Repair :	April 4, 2000 Repair Description: motor burnout
Maintenance Notes	
Notes :	November 5, 2001 Note: starter problems resulted in burnout

FIG. 17

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